Assessment and diagnosis of the poisoned patient

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Abstract

Assessment of an acutely poisoned patient involves taking an appropriate history, assessing the level of consciousness, ventilation and circulation, undertaking a physical examination, and requesting appropriate toxicological and non-toxicological investigations. Diagnosis is based on the history, circumstantial evidence (if available), a cluster of common features (if present) and, occasionally, the results of biochemical or toxicological analyses.

Keywords diagnosis; examination; history; investigations; local toxicity; systemic toxicity; toxicological analyses

Toxicity and poisoning

The toxicity of a substance, and therefore the features of poisoning, can generally be predicted from:

- its physicochemical properties
- its pharmacological/toxicological actions
- the route of exposure
- the dose to which an individual has been exposed.

The features of poisoning are classified as either local or systemic.

Local toxicity is confined to the site of contact of the substance with body surfaces. The route of exposure (eye, skin, respiratory or gastrointestinal tract) determines the anatomical location of the interaction; the physicochemical characteristics of the substance (solubility, volatility, pH) define its nature and extent.

Systemic toxicity depends on the fraction of the dose of the poison that is absorbed into the circulation; systemic toxicity is generally dose-related and can be organ-specific or involve several organs. Although the pharmacological/toxicological effects of the poison are generally proportional to the amount that has been absorbed, the effects are modulated by variations between individuals. Some individuals react in a non-dose-dependent, idiosyncratic manner to some agents (notably metoclopramide, and some phenothiazines and butyrophenones). In others, genetic predisposition can affect the response (e.g. rate of metabolism of codeine to morphine).

The speed with which features appear depends partly on the route of exposure. It is greater with inhalation and injection than with dermal exposure and ingestion.

Assessment of an acutely poisoned patient follows the established clinical method (Table 1):

- immediate assessment of level of consciousness, ventilation and circulation
- history
- examination
- appropriate toxicological and non-toxicological investigations.

Assessment of level of consciousness

The Glasgow Coma Scale (GCS) is the most commonly used method to assess the degree of impairment of consciousness, and in poisoned patients there is good inter-rater reliability.[1] A GCS score of 8 or lower (not obeying commands, not speaking, not eye opening) should prompt careful respiratory assessment, particularly if the laryngeal (gag) reflex has been lost. In poisoned patients, an initial GCS of 8 or lower has been claimed to be both a good[2] and a poor[3] predictor of the need for intubation, although it has also been claimed that a GCS of 8 or lower at any time during admission correlates well with the need for intubation.[3] The AVPU (*A*lert, responsive to *V*erbal stimulation, responsive to *P*ainful stimulation, and *U*nresponsive) responsiveness scale has also been employed and corresponds well to GCS scores when assessing level of consciousness in the poisoned patient.[4]

Ventilation

Pulse oximetry can be used to measure oxygen saturation. The displayed reading can be inaccurate when the saturation is below 70%, when peripheral perfusion is poor, and in the presence of carboxyhaemoglobin or methaemoglobin.[5] Only measurement of arterial blood gases indicates the presence of both hypercapnia and hypoxia. The presence of ventilatory insufficiency (as determined by an arterial partial pressure of oxygen $\leq$9.0 kPa when breathing air and/or arterial partial pressure of carbon dioxide $\geq$6.0 kPa) should lead to a consideration of intubation and assisted ventilation if the central respiratory depression cannot be reversed by the administration of a specific antidote, such as naloxone.

Circulation

Pulse, blood pressure and temperature (core and peripheral) should be measured to assess cardiovascular function. An electrocardiogram (ECG) should be recorded in moderately or severely poisoned patients, particularly when a drug with a cardiotoxic action (e.g. a drug that has the potential to prolong the QRS or the Q–T interval) has been ingested.

History

Adults

About 80% of adults who have ingested an overdose are conscious on arrival at hospital, and the diagnosis of self-

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Assessment and diagnosis of poisoned patients

Assessment of level of consciousness, ventilation and circulation

- What is the Glasgow Coma Scale score?
- Are laryngeal reflexes present?
- Is ventilatory insufficiency present?
- What are the pulse and blood pressure?

History

- Toxicological, medical, psychiatric and social

Circumstantial evidence

- Suicide note
- Circumstances in which patient was found

Examination

See Table 2

Antidotes

- Naloxone
- Flumazenil

Toxicological investigations

- Specific
- Screening

Non-toxicological investigations

- Haematology
- ECG
- Radiology

Table 1

poisoning can usually be made from the history. In unconscious patients, a history from friends or relatives is helpful, and the diagnosis can often be inferred from tablet bottles or a 'suicide note' brought by the paramedics, or made by exclusion of other causes. Self-poisoning must always be considered in the differential diagnosis in any patient with an altered level of consciousness.

Acutely poisoned patients may be emotionally and psychiatrically distressed, and require competent, sympathetic assessment if essential information is not to be missed. It is important to try to establish the nature of the substance taken, the amount involved, the route of exposure and the time of exposure, so that the clinical course can be anticipated and the risk assessed.

Statements about the nature and amount of what has been taken should be regarded with clinical suspicion, however, because these are often inconsistent with laboratory analysis of blood or urine.[6,7] Patients may not use generic drug names, and it is important to clarify the specific preparation involved because the composition of formulations with similar names can differ. Furthermore, self-poisoning is often an impulsive act involving swallowing the contents of the first bottle or blister pack that comes to hand; sometimes, the drugs used may have been prescribed for another individual. Few patients count the number of tablets taken; the amount is often estimated in unquantifiable terms such as 'handfuls' or 'mouthfuls', although the patient may be able to recall the number of strips or packets. When the time of exposure is important (e.g. paracetamol poisoning), the accuracy can be improved by relating events to activities of daily life (e.g. the time of a television programme).

Assessment of the psychological aspects of self-poisoning is covered on pages 103–105 of this issue.

Children

A clear history is unlikely to be obtained from the child, older siblings or a parent. Statements about amounts taken are usually unreliable because the quantities present in containers before such incidents are often unknown.

Circumstantial evidence

Circumstantial evidence is important in establishing a diagnosis of acute poisoning when the patient is very young, has communication or comprehension difficulties or is unconscious.

Children may be found eating potential poisons or with tablets or other materials around their mouth or on their clothing. Similar evidence may be found on unconscious adults, or there may be empty drug containers, tablets or capsules nearby. A lack of personal effects to indicate the identity of an unconscious adult should arouse suspicion of a drug overdose. Protestations of relatives that an individual would never take an overdose are usually incorrect.

Suicide notes are reliable indicators of self-poisoning in the absence of evidence of physical violence as a cause of coma.

Examination

Physical signs are particularly important when trying to elucidate the cause of unexplained coma. A diagnosis of acute poisoning can never be made on the basis of a single physical sign, but there are typical clusters of signs that make a diagnosis of poisoning with specific drugs very likely (Table 2). Head injury should be excluded as a contributing or causative factor in comatose patients.

General observations can reveal useful information. For example, solvents or alcohol may be smelt on the breath, needle track marks can reveal undisclosed illicit substance abuse, atypical bruising can warn of domestic or other violence, and the stigmata of alcoholic liver disease may be apparent.

Skin blisters

Skin blisters can be found in poisoned patients who are, or have been, unconscious.[8,9] Such lesions are not diagnostic of specific poisons, but are sufficiently common in poisoned patients (and sufficiently uncommon in patients unconscious from other causes) to be of diagnostic value.

Neurological signs

Lateralizing neurological signs

With the exception of transient inequality of pupil size, lateralizing neurological signs effectively exclude a diagnosis of acute poisoning unless they can be explained by a pre-existing illness.

Pyramidal tract signs

The usual features of pyramidal tract involvement (hypertonia, hyper-reflexia, extensor plantar responses) are commonly found after poisoning with tricyclic antidepressants and other drugs with marked anticholinergic actions (e.g. the older antihistamines). However, all of these signs may be abolished in deep coma.